

# Interagency Task Force Meeting

May 30, 2019, 9:00 a.m. to 12:00 p.m.

Missouri Water  
Resources Plan

# Agenda


- 9:00 Welcome and Opening Remarks
- 9:05 Introductions
- 9:15 Scenario Planning Results – Localized Gaps
- 10:15 Break
- 10:30 Planning Options for Future Water Needs
- 10:45 Adaptive Management
- 11:30 Question and Answer Session
- 11:50 Next Meeting
- 12:00 Adjourn



# Introductions








# Scenarios for Missouri Plan

# Missouri Planning Scenarios

Scenario	M&I Demands	Ag Demands	Climate	Water Treatment Level	Supply Constraints	Reservoir Regulations
<b>1. Business-As-Usual</b>	<ul style="list-style-type: none"> <li>• Baseline M&amp;I demands</li> <li>• Baseline Rural demands</li> </ul>	<ul style="list-style-type: none"> <li>• Med Ag irrigation</li> <li>• Med Ag processing</li> </ul>	<ul style="list-style-type: none"> <li>• Historical temperatures</li> <li>• Historical precipitation</li> </ul>	<ul style="list-style-type: none"> <li>• Existing water treatment levels</li> </ul>	<ul style="list-style-type: none"> <li>• No water supply constraints</li> </ul>	<ul style="list-style-type: none"> <li>• No re-allocation of USACE reservoirs for supply</li> <li>• Existing permitting process for new reservoirs</li> </ul>
<b>2. Strong Economy/ High Water Stress</b>	<ul style="list-style-type: none"> <li>• High M&amp;I demands</li> <li>• Higher Rural demands</li> </ul>	<ul style="list-style-type: none"> <li>• High Ag irrigation</li> <li>• Med-High Ag processing</li> </ul>	<ul style="list-style-type: none"> <li>• Hotter temperatures</li> <li>• Lower rainfall</li> </ul>	<ul style="list-style-type: none"> <li>• High increase in water treatment levels</li> </ul>	<ul style="list-style-type: none"> <li>• Interstate diversions out of Missouri River Basin</li> <li>• Limitations on GW (select areas)</li> <li>• Prolonged supply disruption on River intakes</li> </ul>	<ul style="list-style-type: none"> <li>• Limited re-allocation of USACE reservoirs for supply</li> <li>• Streamlined permitting process for new reservoirs</li> </ul>
<b>3. Substantial Agricultural Expansion</b>	<ul style="list-style-type: none"> <li>• Baseline M&amp;I demands</li> <li>• Baseline Rural demands</li> </ul>	<ul style="list-style-type: none"> <li>• Med Ag irrigation</li> <li>• Highest Ag processing</li> </ul>	<ul style="list-style-type: none"> <li>• Warmer temperatures</li> <li>• Greater rainfall</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate increase in water treatment levels</li> </ul>	<ul style="list-style-type: none"> <li>• Interstate diversions out of Missouri River Basin</li> <li>• Limitations on GW (select areas)</li> </ul>	<ul style="list-style-type: none"> <li>• Limited re-allocation of USACE reservoirs for supply</li> <li>• Existing permitting process for new reservoirs</li> </ul>
<b>4. Weak Economy/ Low Water Stress</b>	<ul style="list-style-type: none"> <li>• Low M&amp;I demands</li> <li>• Baseline Rural demands</li> </ul>	<ul style="list-style-type: none"> <li>• Med Ag irrigation</li> <li>• Med Ag processing</li> </ul>	<ul style="list-style-type: none"> <li>• Warmer temperatures</li> <li>• Greater rainfall</li> </ul>	<ul style="list-style-type: none"> <li>• Existing water treatment levels</li> </ul>	<ul style="list-style-type: none"> <li>• No water supply constraints</li> </ul>	<ul style="list-style-type: none"> <li>• No re-allocation of USACE reservoirs for supply</li> <li>• Existing permitting process for new reservoirs</li> </ul>

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# Scenario Planning Results – Localized Gaps

# Limitations of the Analysis

- Comparisons of supply and demand at the subregional (HUC<sub>4</sub>) and even watershed (HUC<sub>8</sub>) scale can miss localized stress and gaps
- Results do not consider in-place infrastructure to move water from one location to another
- Alluvial demands treated as groundwater (but may impose stress to surface water)
- Planned or proposed projects are not considered








# Interpreting the Results for Surface Water

## Identifying Potential Supply Stress

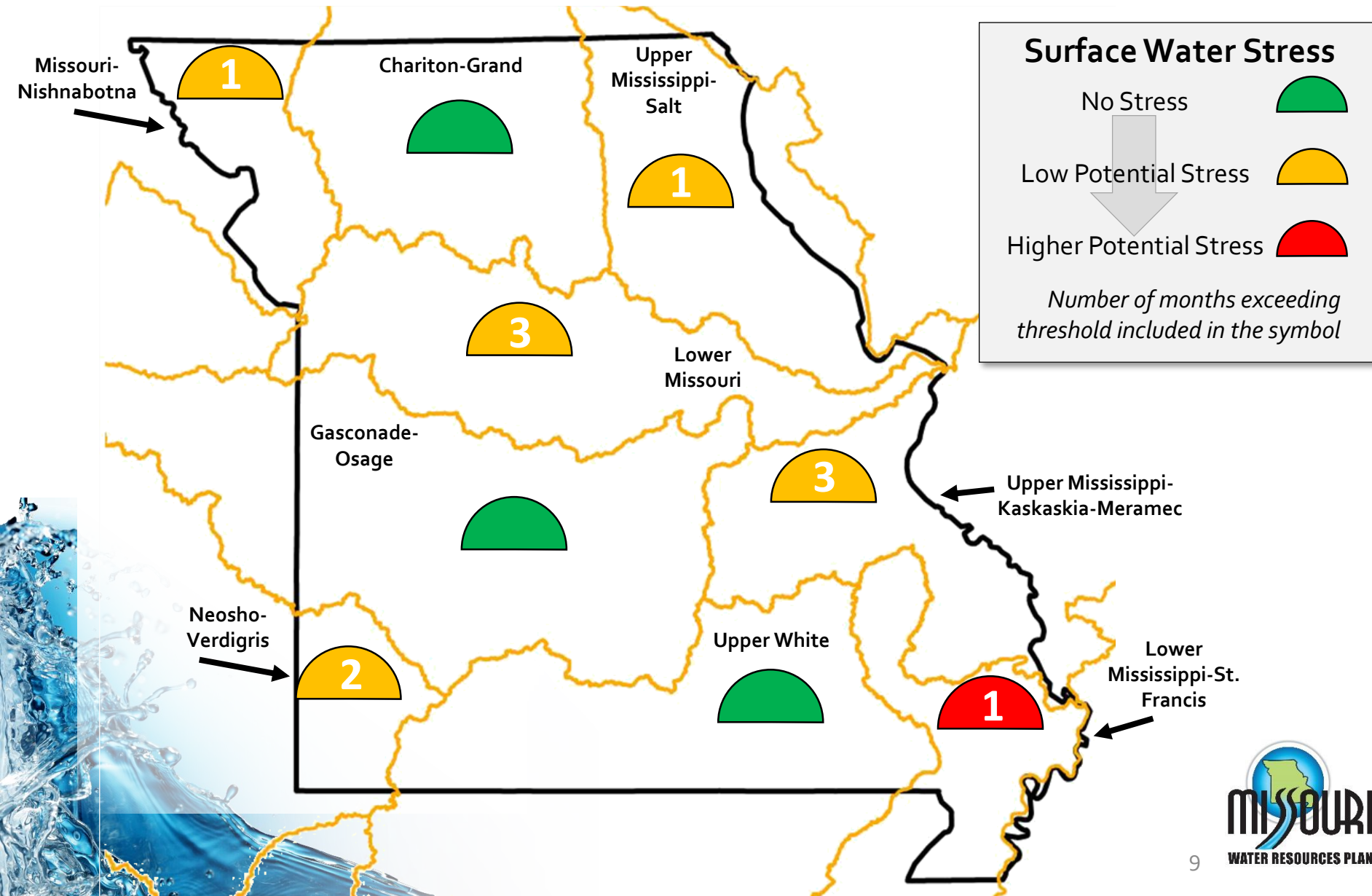
### Average Conditions

Condition	Analysis	Result	Potential Water Supply Stress	Key
Average	Monthly	Demand < 50% of Supply for entire year	No Stress	
	Monthly	Demand > 50% of Supply for 1 month or more	Low Stress	
	Monthly	Demand > Supply for 1 month or more	Higher Stress	

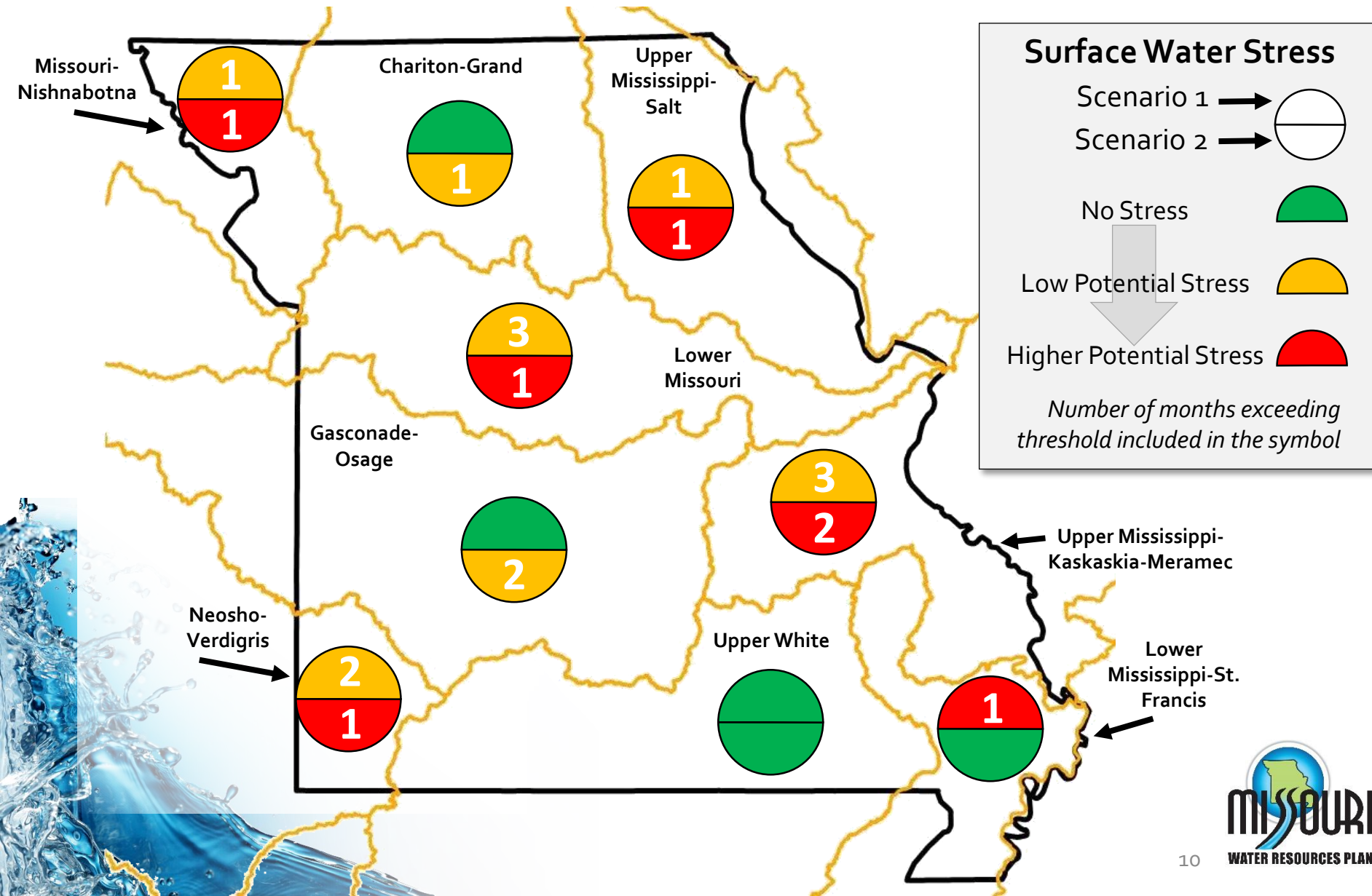




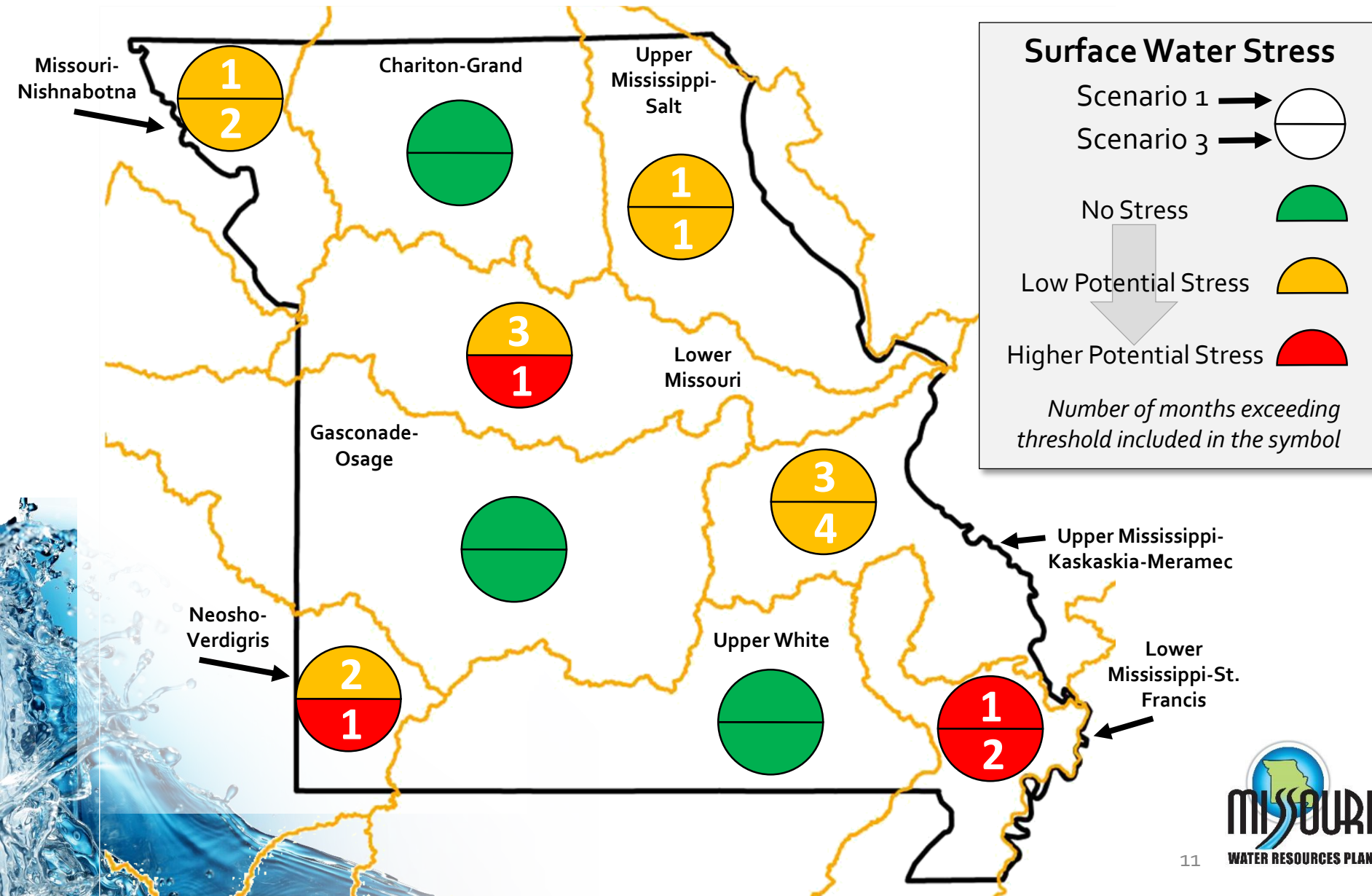
# Scenario 1 – Business-As-Usual (Average Conditions)



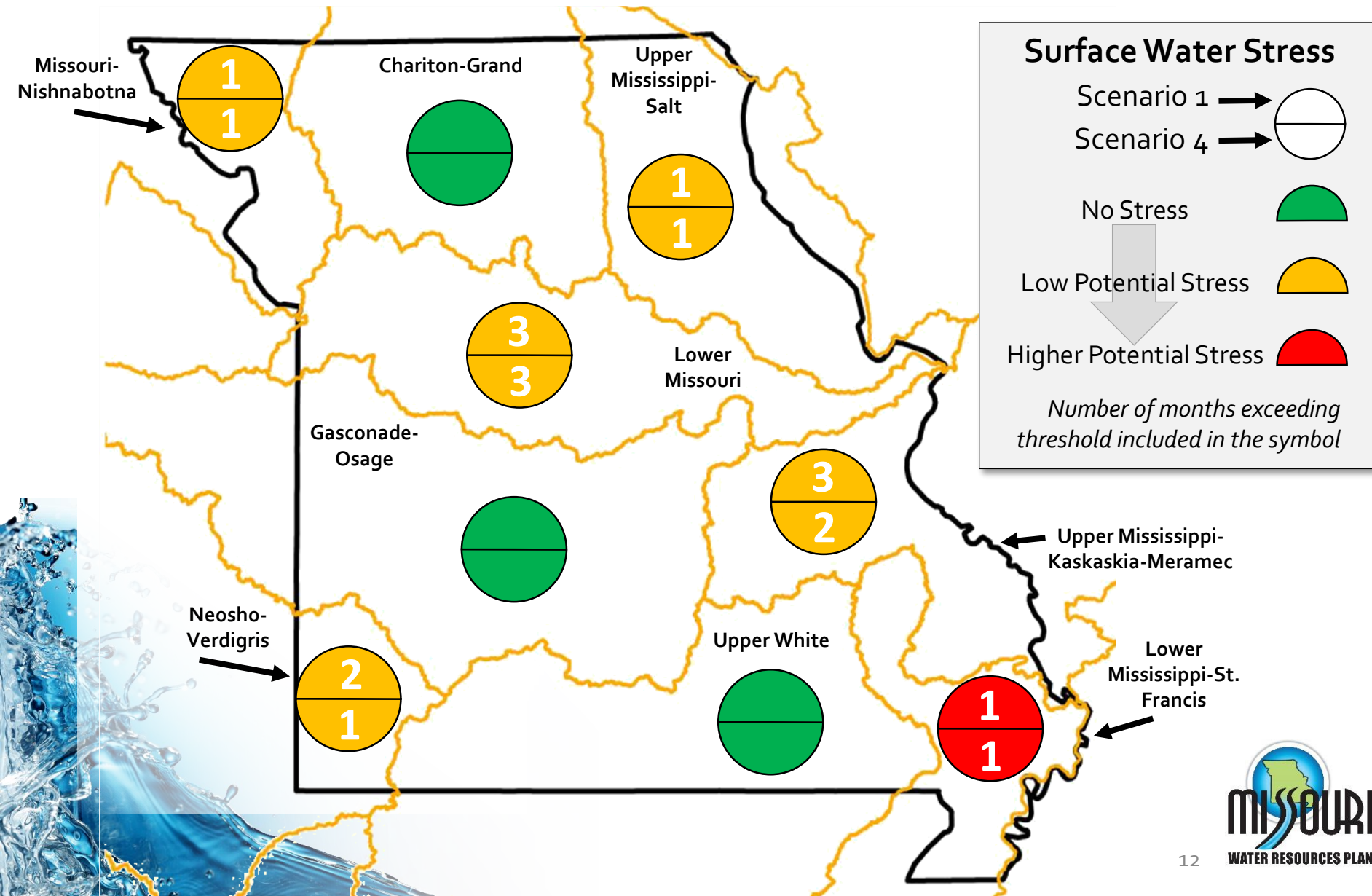
# Scenario 1 – Business-as-Usual & Scenario 2 – Strong Economy/High Water Stress (Average Conditions)



# Scenario 1 – Business-as-Usual & Scenario 3 – Substantial Agricultural Expansion (Average Conditions)






# Scenario 1 – Business-as-Usual & Scenario 4 – Weak Economy/Low Water Stress (Average Conditions)








# Subregion Surface Water Result Summary

- Non-Major River Demands – Average Conditions

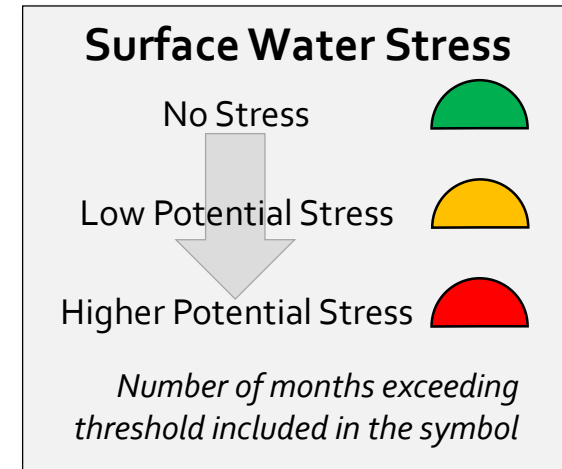
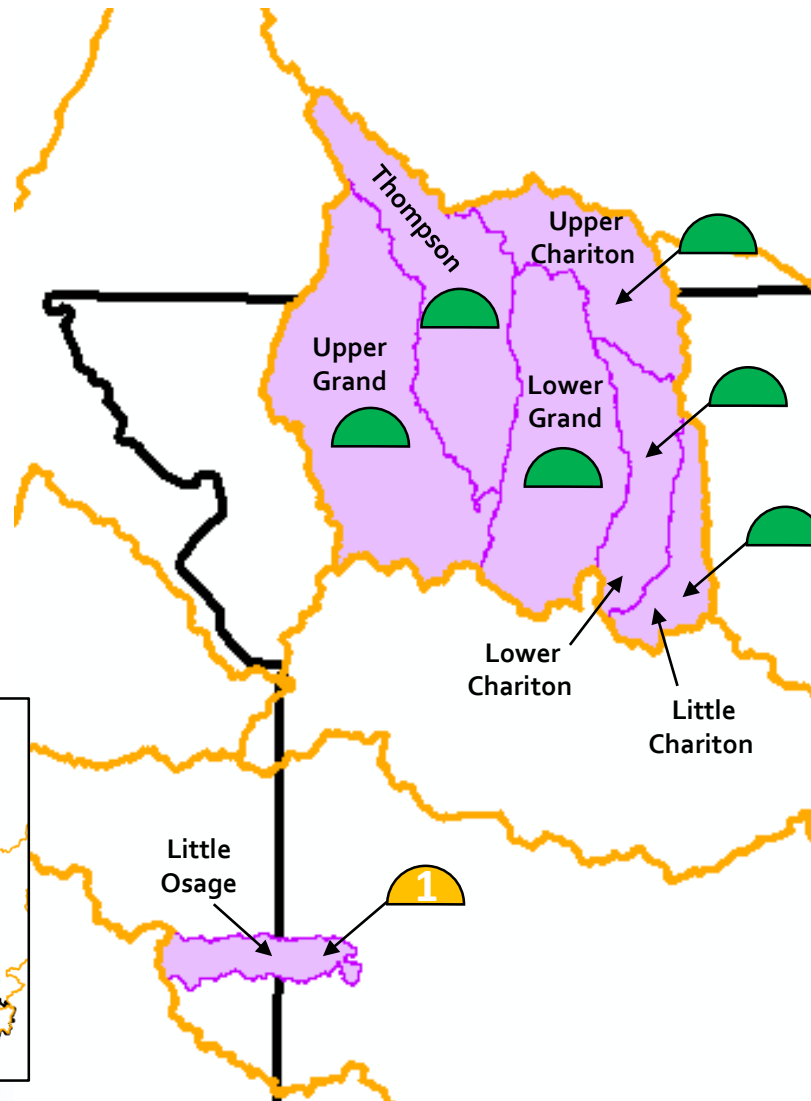
Potential Water Supply Stress	# of Basins Scenario 1 – Business-As- Usual	# of Basins Scenario 2 – Strong Economy/ High Water Stress	# of Basins Scenario 3 – Substantial Agricultural Expansion	# of Basins Scenario 4 – Weak Economy/ Low Water Stress
 Demand < 50% of Supply for entire year	3	2	3	3
 Demand > 50% of Supply for 1 month or more	5	2	3	5
 Demand > Supply for 1 month or more	1	5	3	1

# Subregion Surface Water Result Summary

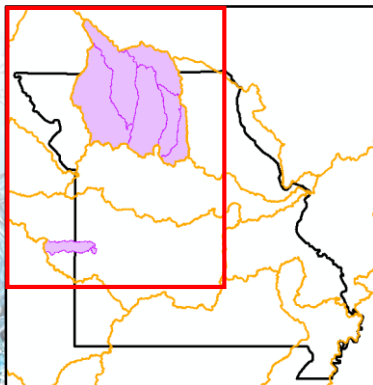
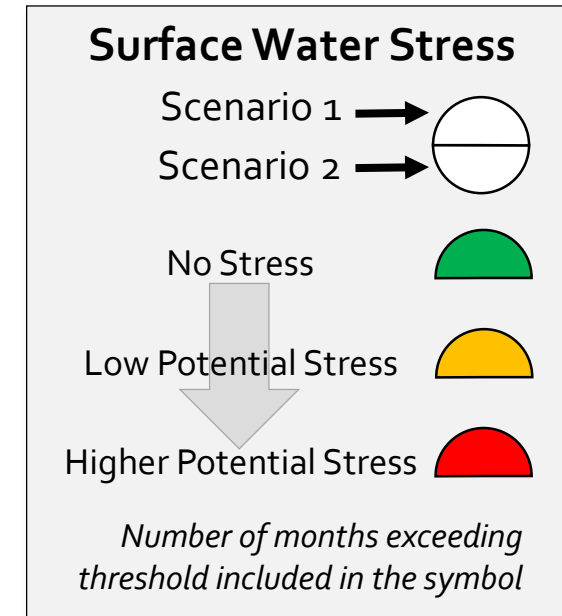
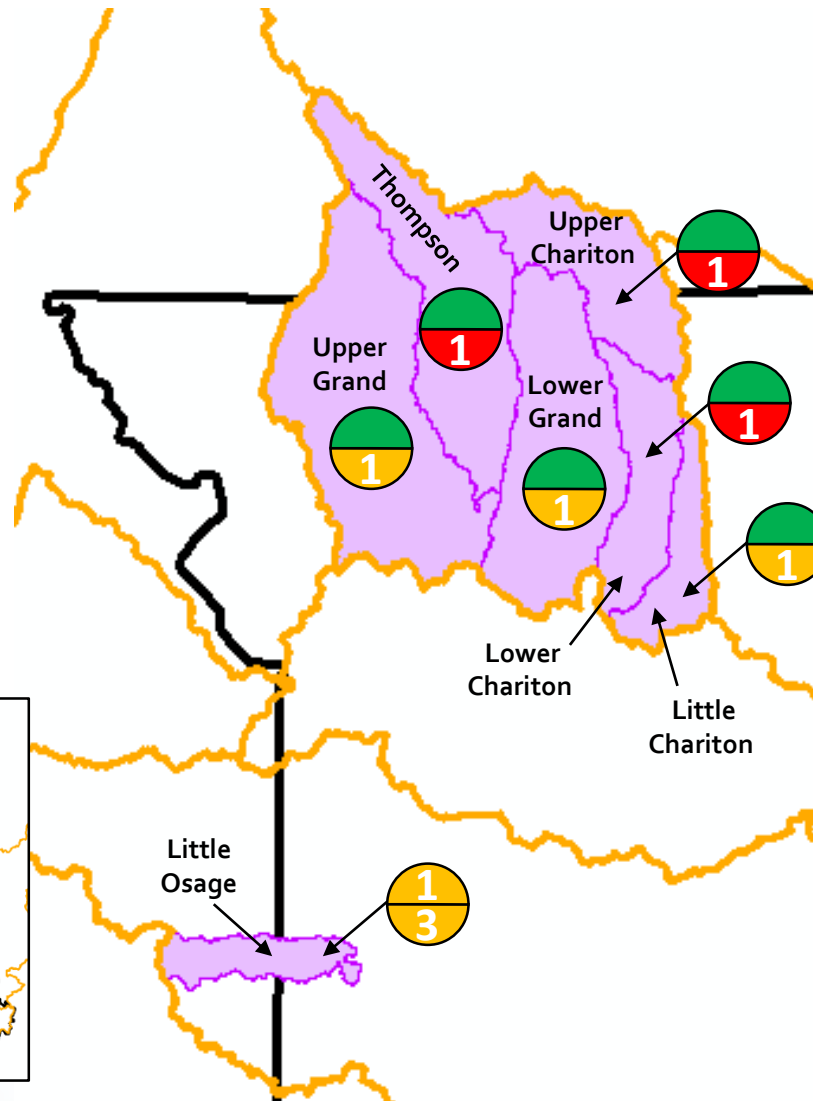
- Non-Major River Demands – Drought Conditions

Potential Water Supply Stress	# of Basins Scenario 1 – Business-As- Usual	# of Basins Scenario 2 – Strong Economy/ High Water Stress	# of Basins Scenario 3 – Substantial Agricultural Expansion	# of Basins Scenario 4 – Weak Economy/ Low Water Stress
 Demand < 50% of Supply for entire year	1	1	1	1
 Demand > 50% of Supply for 1 month or more	0	0	0	0
 Demand > Supply for 1 month or more	8	7	8	8

# Scenario 1 – Business-As-Usual (Average Conditions)

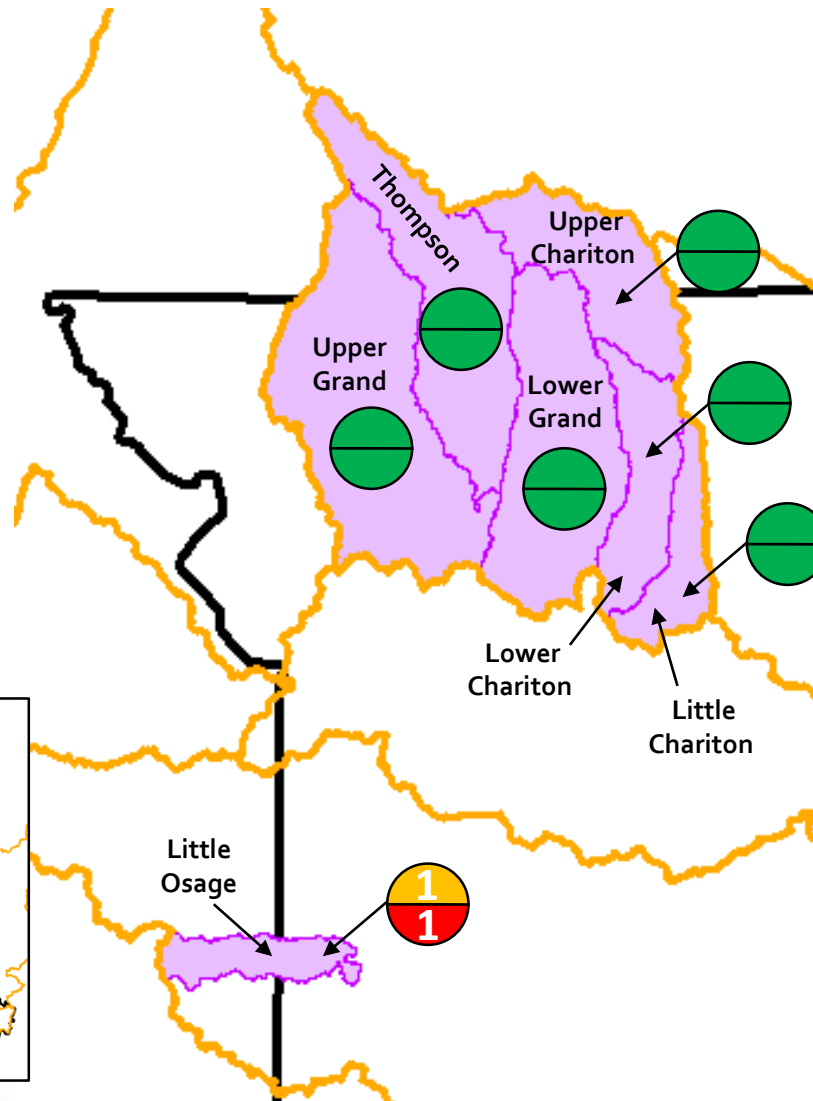


# Scenario 1 – Business-as-Usual & Scenario 2 – Strong Economy/High Water Stress (Average Conditions)





# Scenario 1 – Business-As-Usual & Scenario 3 – Substantial Agricultural Expansion (Average Conditions)



## Surface Water Stress

Scenario 1 →

Scenario 3 →

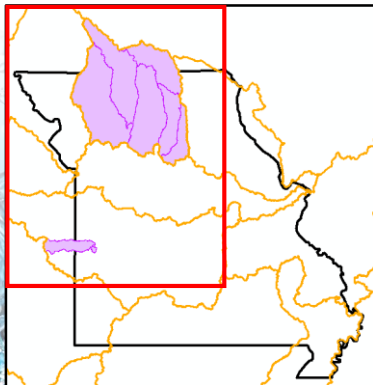
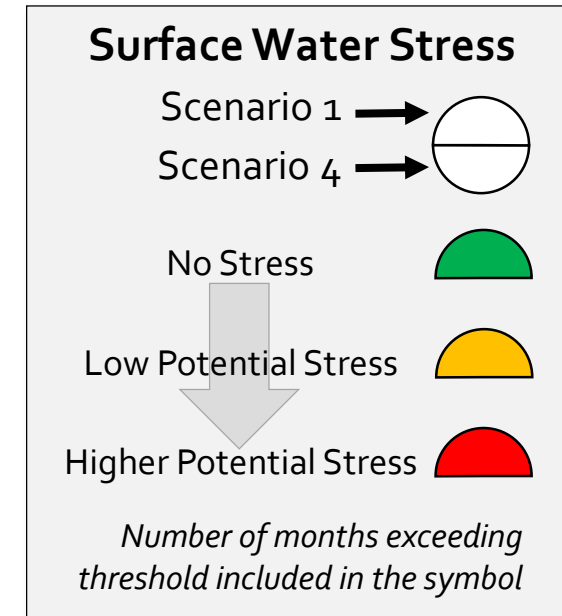
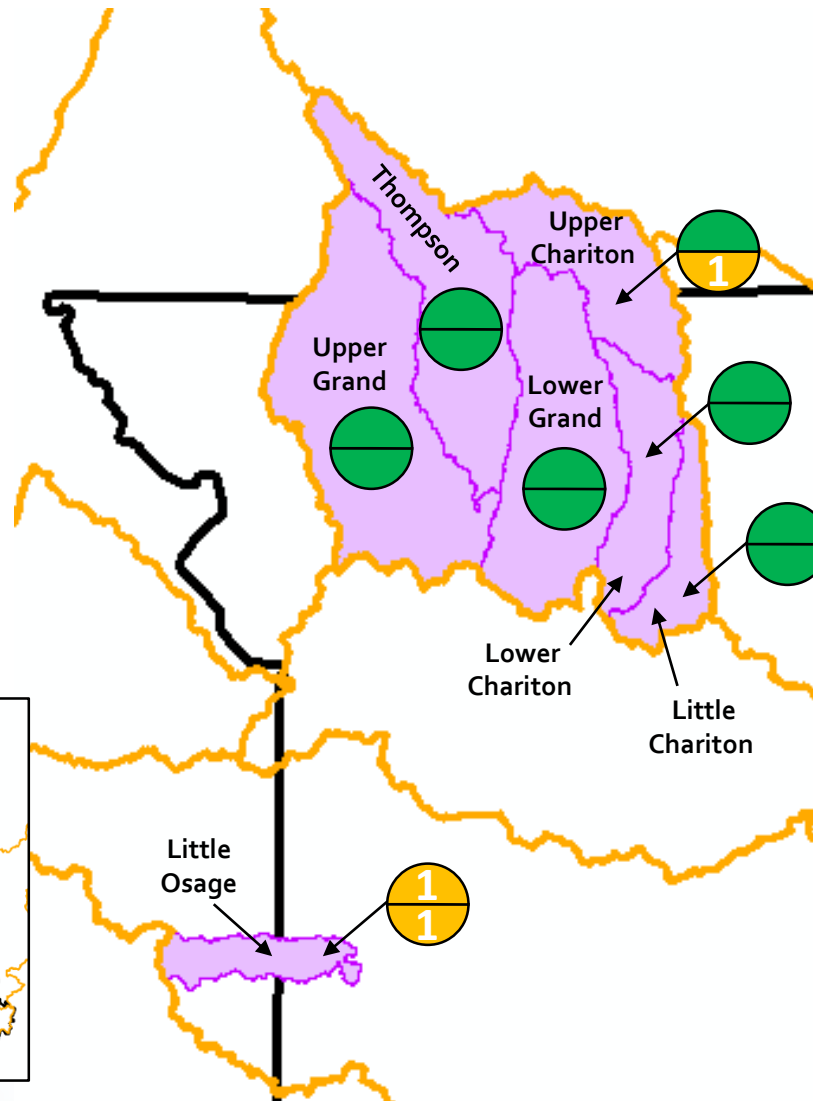
No Stress

Low Potential Stress

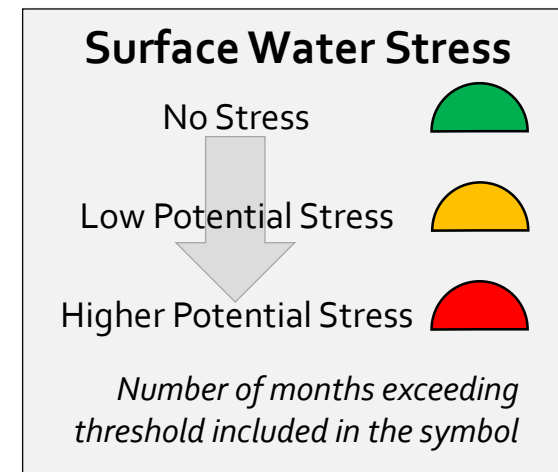
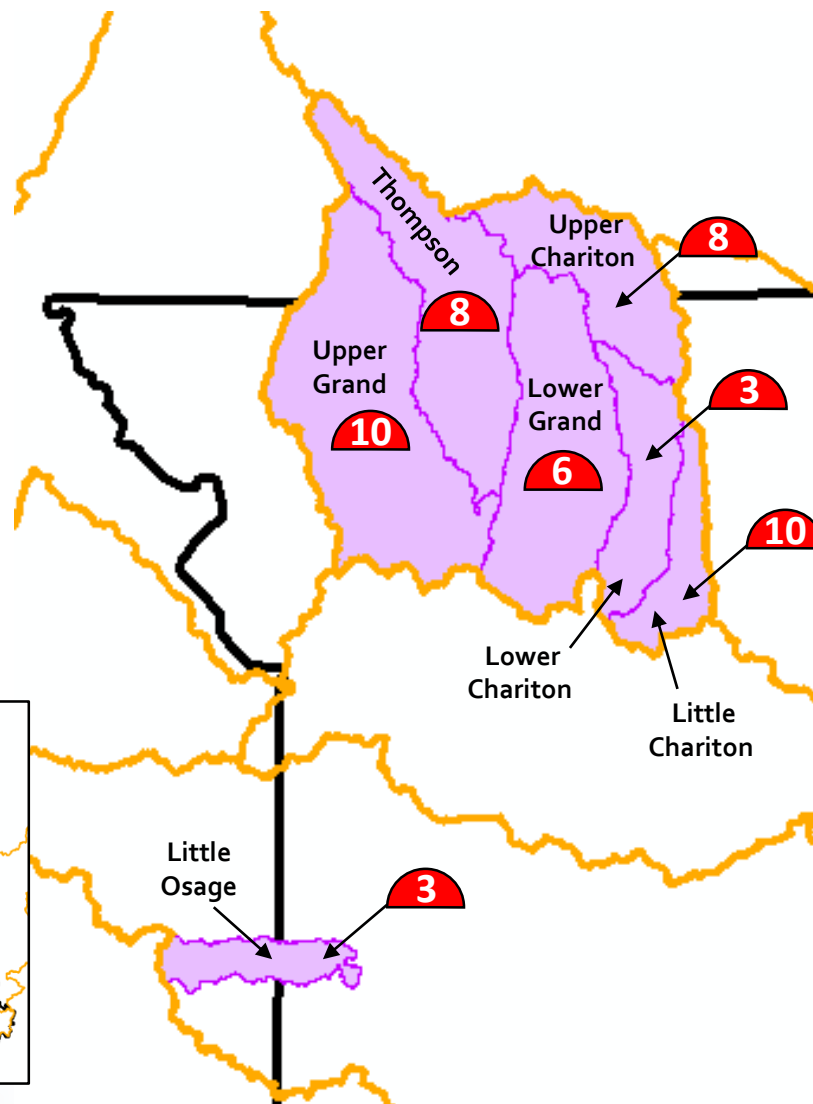
Higher Potential Stress

*Number of months exceeding threshold included in the symbol*

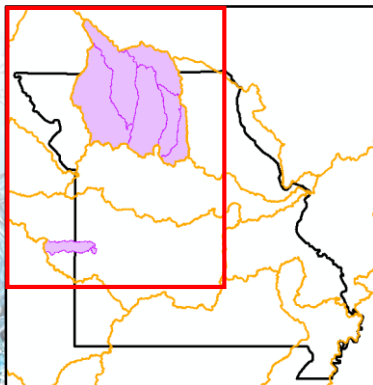
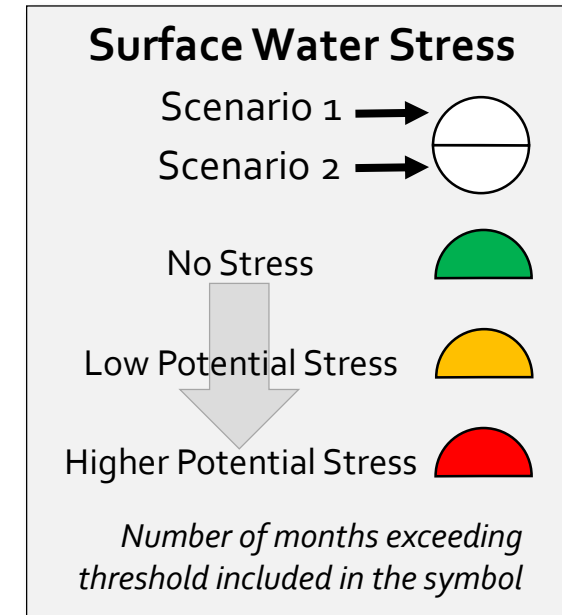
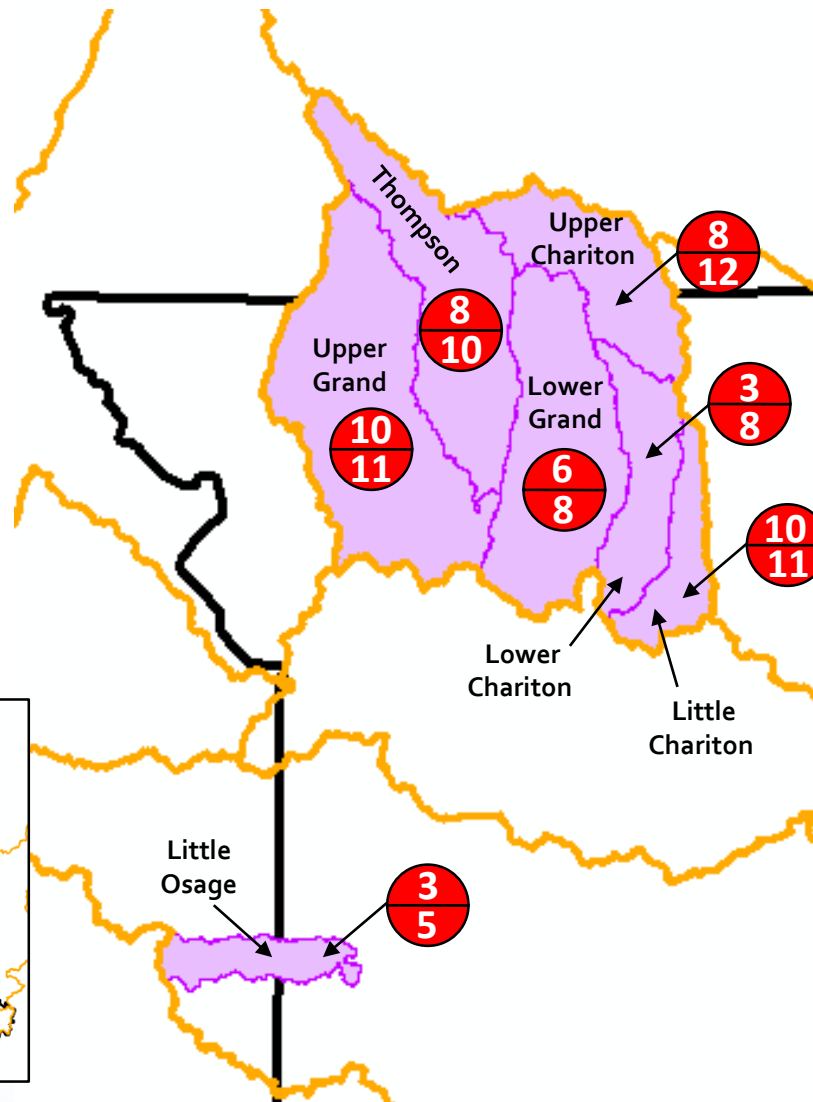
# Scenario 1 – Business-As-Usual & Scenario 4 – Weak Economy/Low Water Stress (Average Conditions)



# Scenario 1 – Business-As-Usual (Drought of Record Conditions)

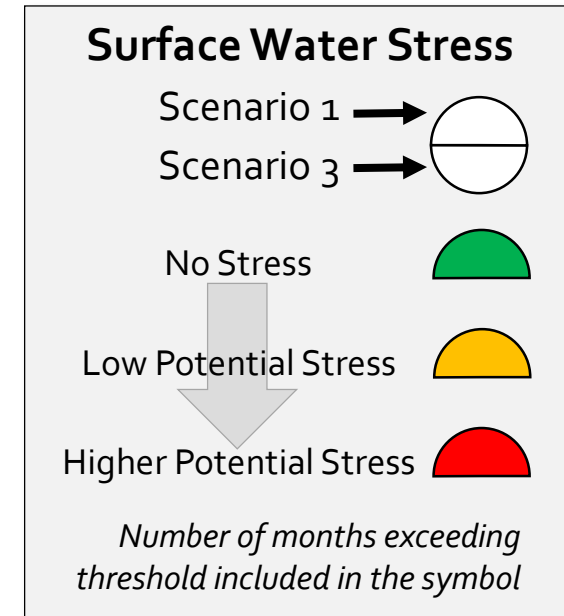
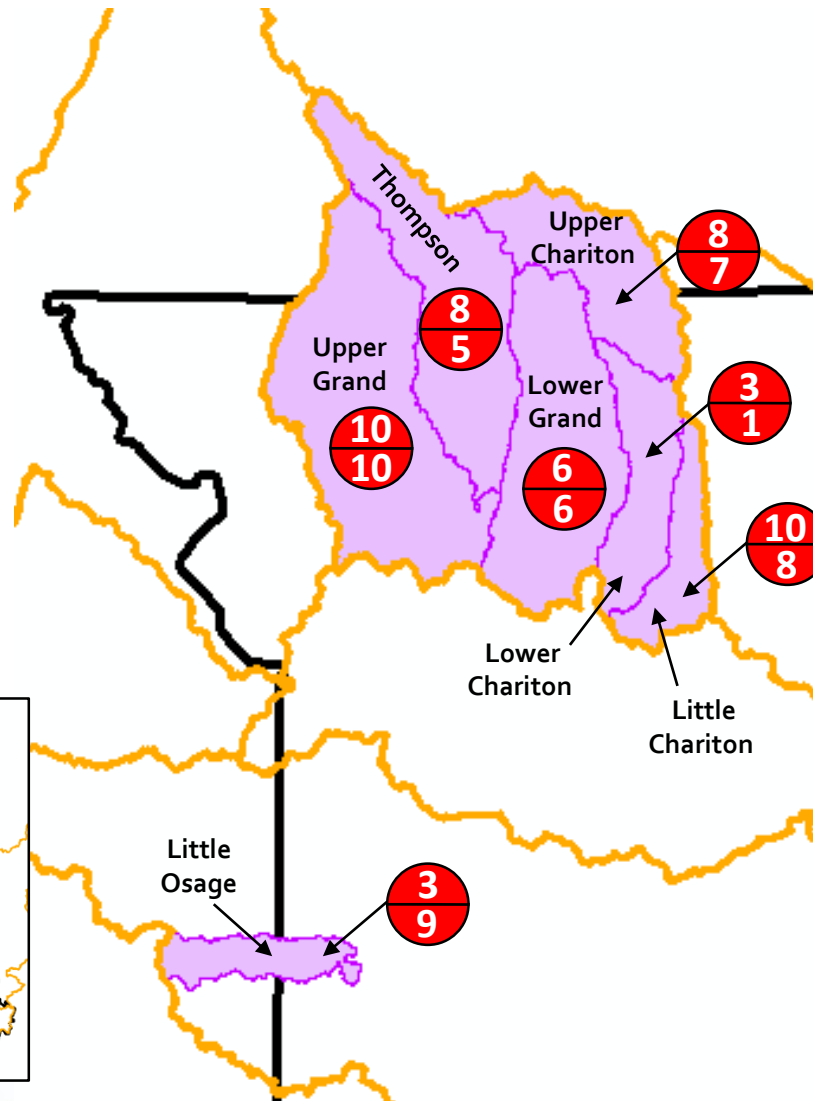


# Scenario 1 – Business-as-Usual & Scenario 2 – Strong Economy/High Water Stress (Drought of Record Conditions)

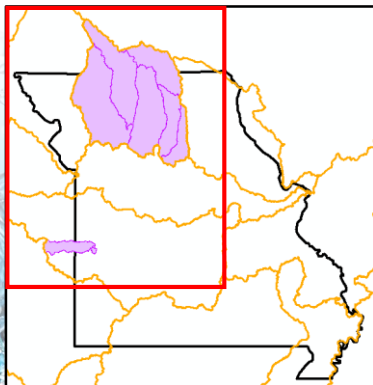
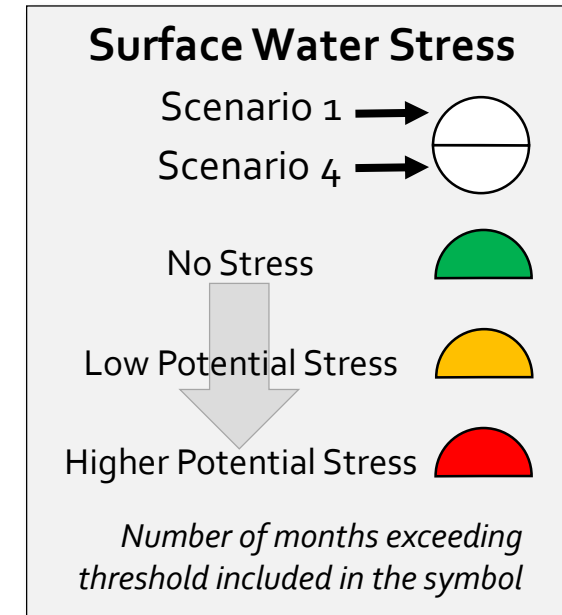
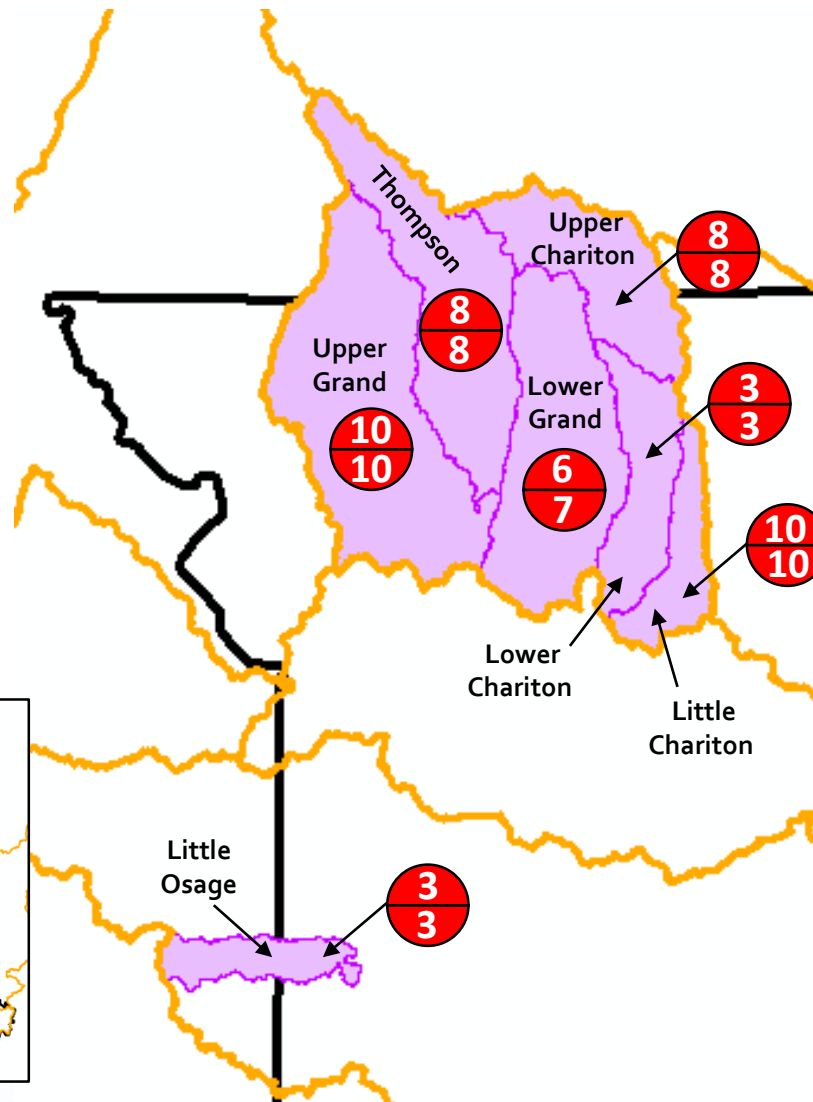




# Scenario 1 – Business-as-Usual & Scenario 3 – Substantial Agricultural Expansion (Drought of Record Conditions)








# Scenario 1 – Business-as-Usual & Scenario 4 – Weak Economy/Low Water Stress (Drought of Record Conditions)



# Interpreting the Results for Groundwater

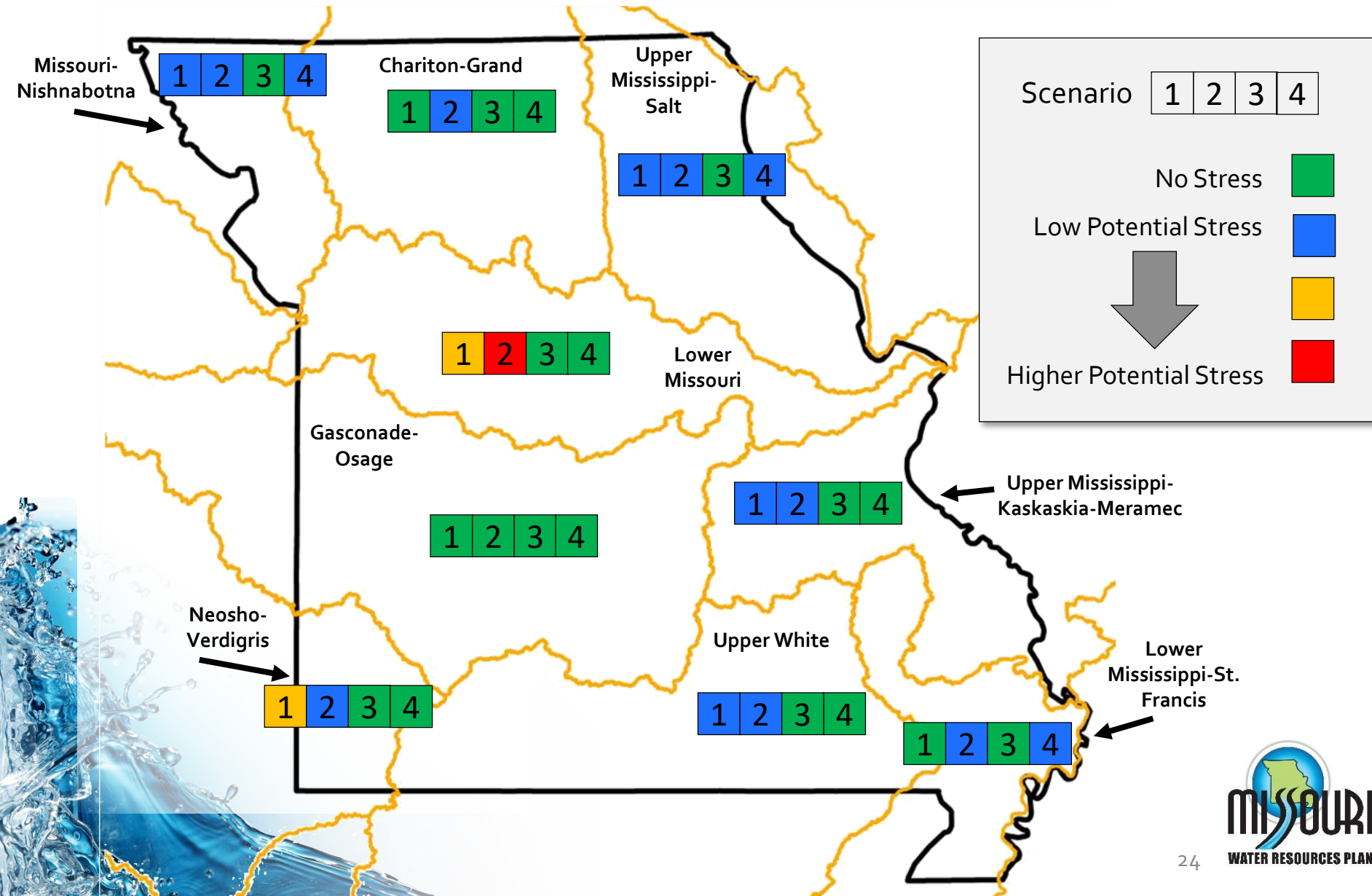
## Identifying Potential Supply Stress

Condition	Analysis	Current GW Levels	Withdrawals* as a Percent of Recharge	Potential Water Supply Stress	Key
Average	Annual	No Trend	Decrease	No Stress	
		No Trend	Relatively Flat		
		No Trend Declining	Increase Flat or Decrease	Low Stress	
		Declining	Increase		
		Declining	Substantial Increase	Increasing	

\* Relative to 2016 withdrawals

# Groundwater **Relative** Results – Scenarios 1, 2, 3, and 4





## Average Conditions





# Subregion Groundwater Result Summary

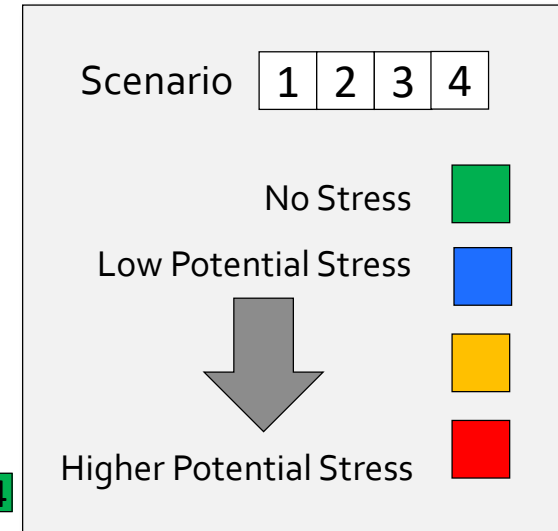
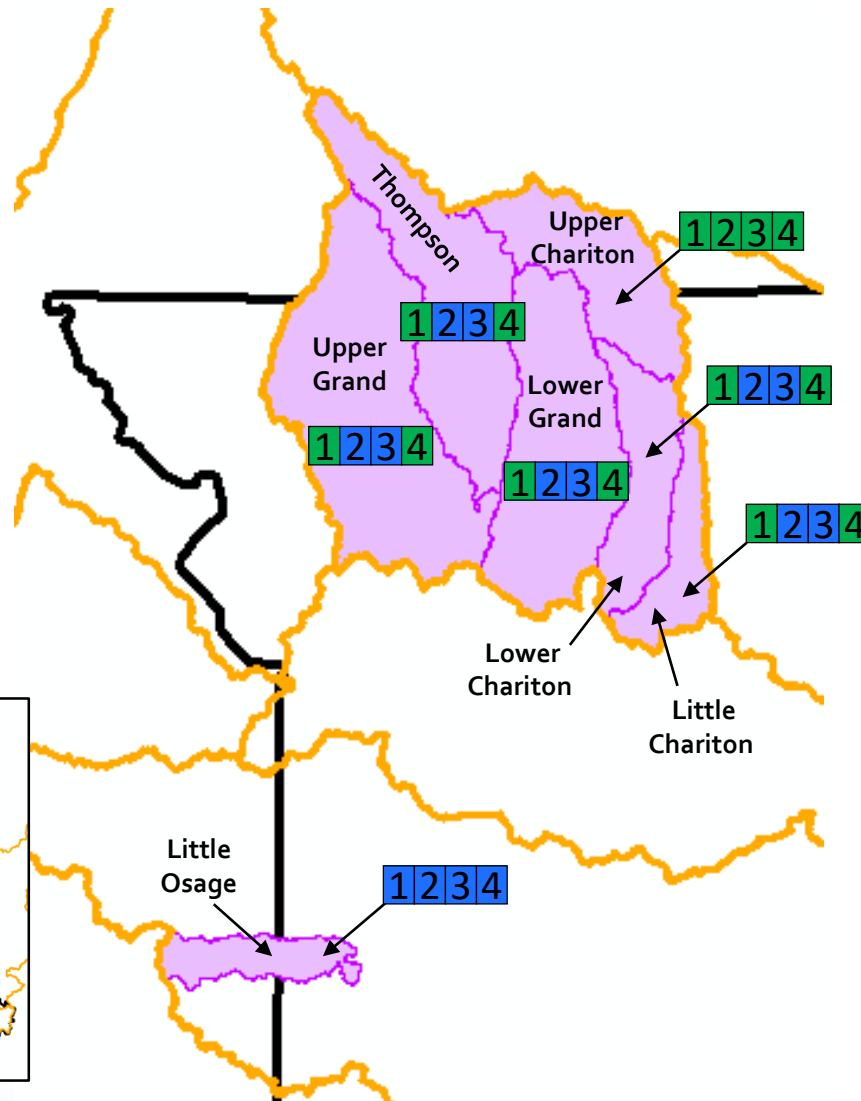
- Average Conditions

Key	Current GW Levels	Withdrawals* as a Percent of Recharge	Number of Basins			
			Scen. 1 - Business-As-Usual	Scen. 2 - Strong Economy/ High Water Stress	Scen. 3 – Substantial Agricultural Expansion	Scen. 4 - Weak Economy/ Low Water Stress
	No Trend	Decrease	3	1	9	6
	<u>No Trend</u> Declining	<u>Increase</u> Flat or Decrease	4	7	0	3
	Declining	Increase	2	0	0	0
	Declining	Substantial Increase	0	1	0	0

\* Relative to 2016 withdrawals

# Groundwater Results for Scenarios 1, 2, 3 and 4

## Average Conditions




**Scenario 1** – Business-As-Usual

**Scenario 2** – Strong Economy/High Water Stress

**Scenario 3** – Substantial Agricultural Expansion

**Scenario 4** – Weak Economy/Low Water Stress



# Planning Options to meet Future Water Needs

# M&I Options to Meet Future Water Needs

- Additional/expansion of surface storage
- Conveyance
- Wastewater reuse
- Expanded conservation
- Conjunctive use (groundwater/surface water)
- System redundancy (intakes and conveyance)
- Regionalization of water systems
- Enhanced water treatment



# Agricultural Options to Meet Future Water Needs

- Additional storage
- Conveyance
- Conjunctive use of surface water and groundwater
- System efficiency (in the Bootheel with furrow irrigation and transition to high value crops)
- Drainage water recycling
- Meeting demand for expanded food processing operations
- Expanded groundwater use for livestock
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- Surface impoundments for livestock in northwest Missouri
- Cropping system management





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# Scenario Planning and Adaptive Management

# Steps in Scenario Planning

- 1) Identify major uncertainties that can impact the future
- 2) Select most important uncertainties as “drivers” of scenarios
- 3) Combine uncertainty drivers into scenarios that represent a different possible futures
- 4) Measure impacts of scenarios and assess options to address impacts
- 5) Use an adaptive management framework for continuous re-assessment and implementation of options



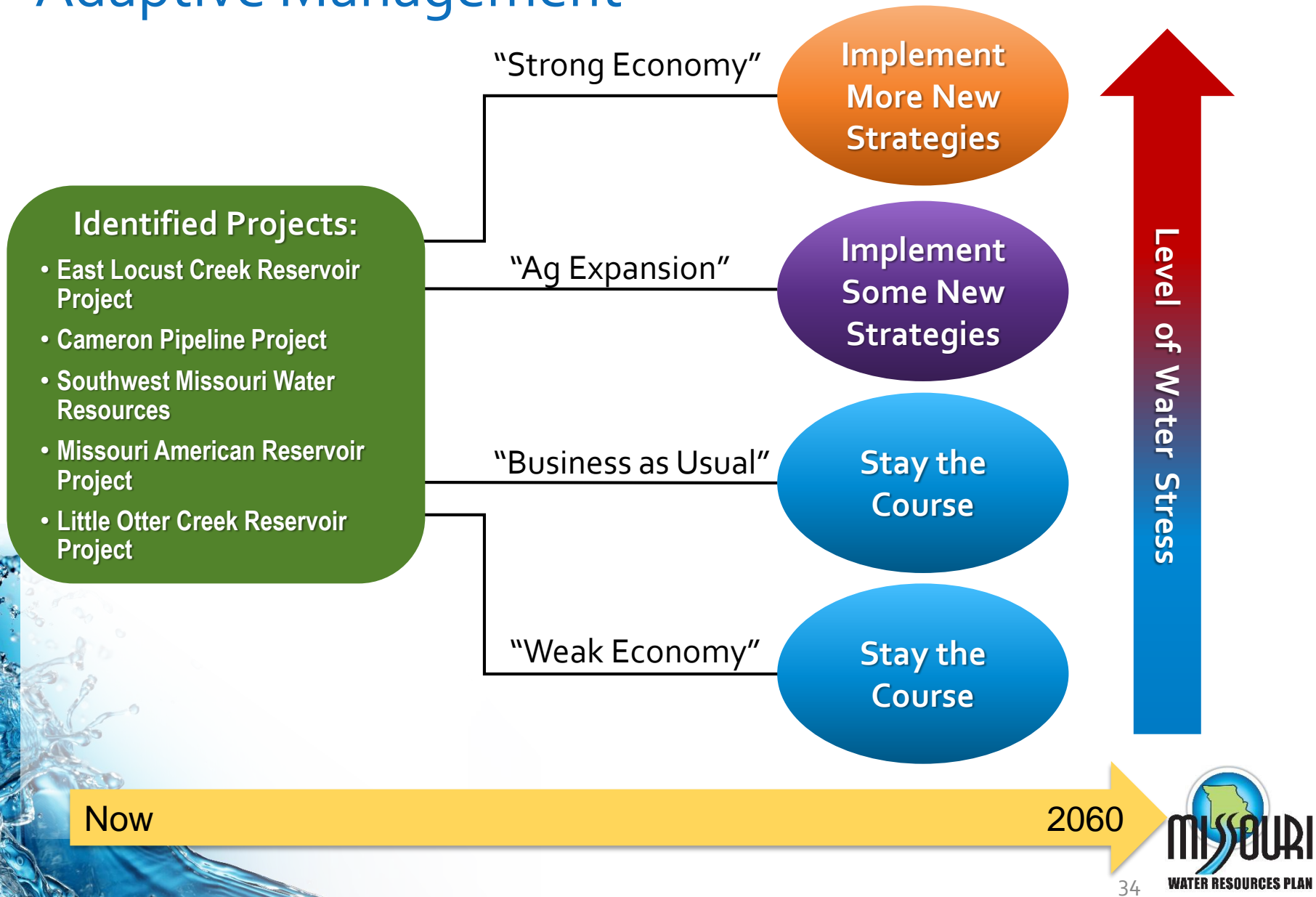
## Use Adaptive Management for Continuous Re-Assessment and Implementation of Options



# Adaptive Management



# Adaptive Management





# Missouri Planning Scenarios

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# Adaptive Management Overview & Framework

Adaptive management is a framework that can be used to implement water supply options as the future unfolds, in a structured way to avoid the pitfalls of either under-performance or over-investment.

## Terms:

- Risk Triggers – uncertainties that can drive the need for new projects, which are tied back to scenario planning
- Outcomes – consequences or results of the “risk triggers” occurring
- Options – identification of water supply options that can be implemented to mitigate the “outcomes”



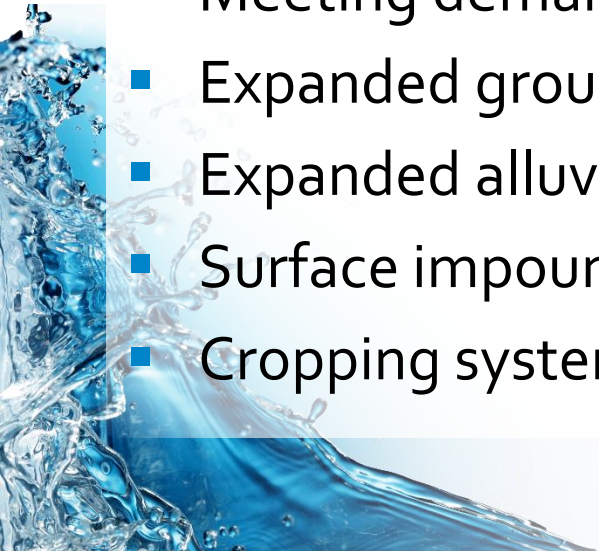
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- Conveyance
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- Regionalization of water systems
- Enhanced water treatment



# Agricultural Options to Meet Future Water Needs

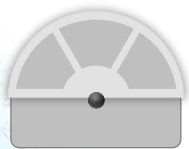
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# Adaptive Management – M&I Risk Triggers



## Water Supply Options



Risk Trigger



Outcome

- Additional/expansion of surface storage
- Conveyance
- Wastewater reuse
- Expanded conservation
- Conjunctive use (groundwater/surface water)
- System redundancy (intakes and conveyance)
- Regionalization of water systems
- Enhanced water treatment



# Adaptive Management – M&I Risk Triggers

\*Similar to Strong Economy/High Water Stress



## Potential Water Supply Options

- New or re-purposed surface reservoir
- Alternative reservoir project
- Increased water conservation
- Non-Potable wastewater reuse
- Surface/ground-water conjunctive use
- Indirect Potable wastewater reuse
- New water treatment
- Regionalization of some water systems
- System redundancy: new river intake

# Adaptive Management – M&I Risk Triggers

\*Similar to Weak Economy/Low Water Stress



## Potential Water Supply Options

- Explore new options
- Alternative reservoir project
- Stay the course but keep monitoring situation
- Increased water conservation
- Conjunctive use
- New water treatment

# Adaptive Management – Agricultural Risk Triggers



## Water Supply Options



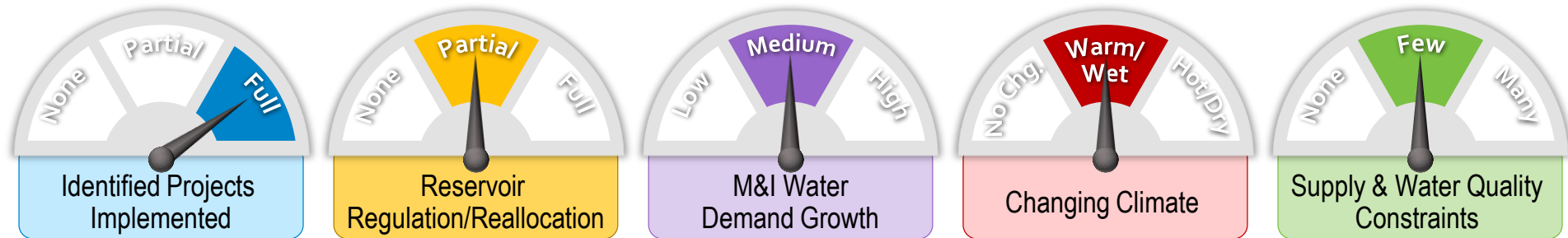
Risk Trigger

Outcome

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- Conveyance
- Conjunctive use of surface water and groundwater
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- Surface impoundments for livestock in northwest Missouri
- Cropping System Management

# Adaptive Management – Agricultural Risk Triggers

\*Similar to Substantial Ag Expansion



## Potential Options

- Drainage water recycling
- Meeting demand for expanded food processing operations
- Alternative reservoir project
- Expanded groundwater use for livestock
- Surface impoundments for livestock in northwest Missouri
- System efficiency in the Bootheel
- Conjunctive use of surface water and groundwater
- Surface impoundments for livestock in northwest Missouri

# Adaptive Management – Agricultural Risk Triggers

\*Similar to Strong Economy/High Water Stress

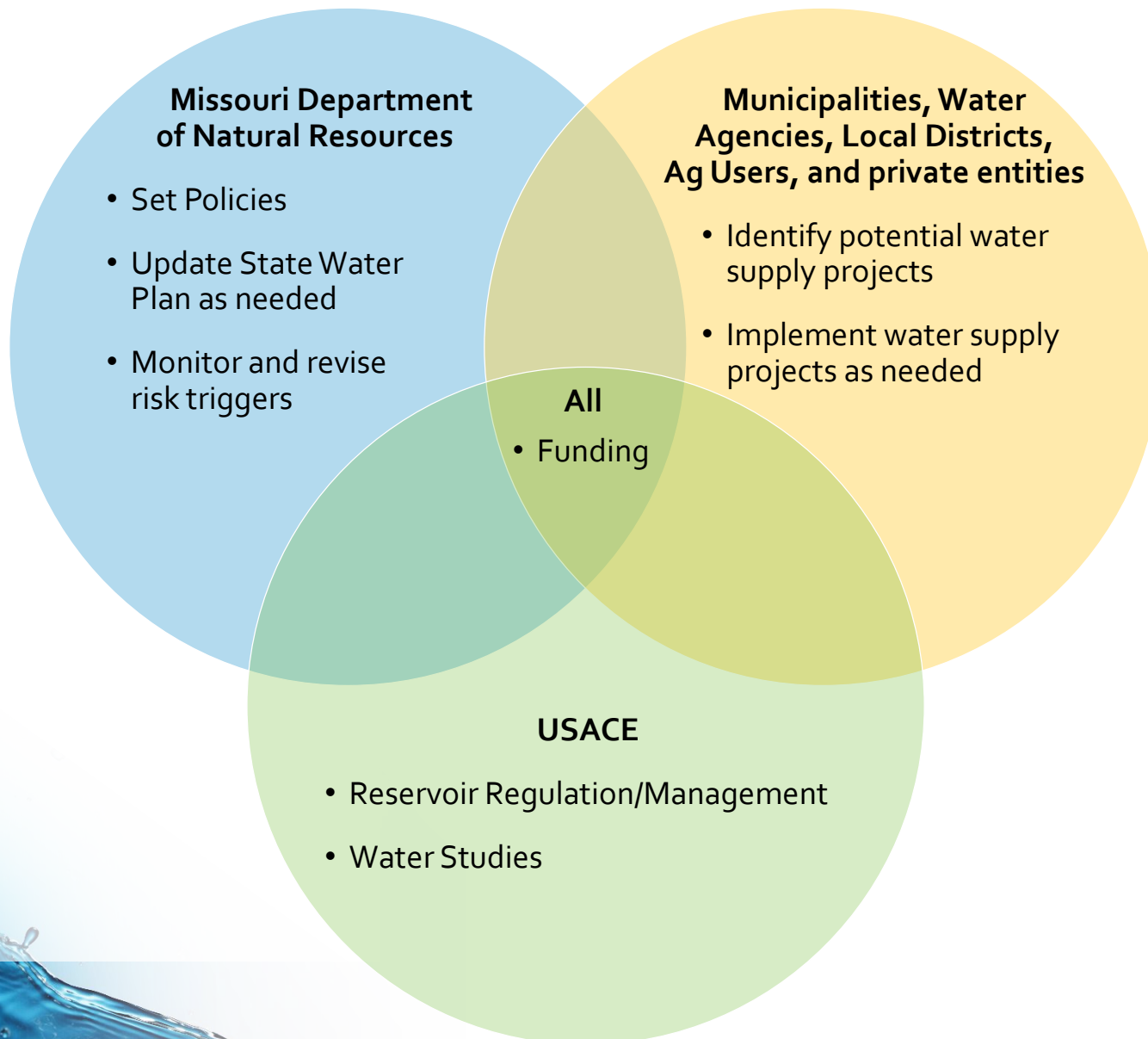


## Potential Options

- Drainage water recycling
- System efficiency (in the Bootheel with furrow irrigation and transition to high value crops)
- Alternative reservoir project
- Expanded groundwater use for livestock
- Expanded alluvial groundwater use for additional irrigation
- Surface impoundments for livestock in northwest Missouri
- System efficiency in the Bootheel
- Additional storage
- Conveyance
- Cropping system management
- Surface impoundments for livestock in northwest Missouri



# Roles for Adaptive Management



# Technical Workgroup Update



# Questions & Discussion



# Next Interagency Task Force Meeting

November 6, 2019

1:00 p.m. to 4:00 p.m.

Lewis and Clark State Office Building,  
Jefferson City, MO





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Thank You